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Reducing Complications of IV Cannulation: A Quality Improvement Project

BHAVANA BHUSHAN LAKHKAR[1], SACHIN DAMAKE[2]

ABSTRACT

Introduction: Intravenous (IV) cannula insertion is the most common invasive procedure in Neonatal Intensive Care Unit (NICU). A large number of complications are due to cannula itself, increasing the morbidity and sometimes duration of NICU stay in newborn.

Aim: To find the impact of structured training program for nurses and residents on IV cannula related complications.

Materials and Methods: The study was done in two phases with a structured training program (of doctors and nurses) after first phase. In first and second phase, the newborns with IV cannula insertion (each cannula separately) were included in the study. Those with no parental consent or having bleeding disorder were excluded. The site was observed for complications, duration of stay and reason for removal, after recording the details of baby.

Results: Total of 190 babies with 300 IV lines and 120 babies with 373 IV lines were the subjects in two phases. Significant changes were observed after training program. Number of IV insertions (2.5 to 1.9 per baby) and complications (190, 63% to 125, 33.5%, p-value <0.0001) significantly reduced. Indicated removal (98, 32.6% to 247, 66.4%, p-value <0.00001) and duration of stay (2.5 days to 5 days, p-value <0.00001) improved. Extravasation was the most common complication which also significantly reduced.

Conclusion: Training of staff nurses and residents in IV cannula insertion and maintenance should be a part of hospital activities for better outcome.

Keywords: Extravasations, Neonates, Neonatal intensive care unit, Thrombophlebitis

INTRODUCTION

One of the most common invasive procedures in NICU is introduction of IV catheter. Though the NICU staff may be trained and confident in the procedure due to repeated exposure, unfortunately a large number of complications do occur and are responsible for reinsertions, abscesses and prolongs the duration of stay. Legemaat M et al., reported infiltration as the most common complication and occurred in 73% of lines inserted and most common reason to remove cannula was complications [1]. A randomised controlled trial of elective removal of cannula in 72-96 hours showed no reduction in extravasations, instead had some other complications [2].

Faheim SS et al., studied the effect of training of staff nurses on the complications due to IV cannula insertion and found significant improvement in prevention and management of complications [3].

Present study aimed to see whether training programs conducted for NICU staff improves the outcome.

MATERIALS AND METHODS

It was a prospective, intervention study conducted in two phases in a NICU of a tertiary hospital after obtaining ethical clearance (letter no DMIMS (DU)/IEC/2017-18).

First Phase

All the newborns admitted in the NICU who needed IV cannula insertion were included during the period of October 2017 till December 2017. If parents denied consent or baby had bleeding/clotting disorder, they were excluded. Once cannula was inserted, details of baby, site of cannula, person (staff nurses and residents) who inserted cannula, drugs which were given, duration of cannula before removal and reason for removal were noted. If simultaneously more than one IV cannula were inserted each one was followed till removal.

Training Program

At the end of three months, a structured training program was conducted to make sure that each and every nurse and residents working in NICU attended the program. The program lasted for 5 days and was conducted by the NICU in-charge. Following points were emphasised:

1. To hand wash before procedure.
2. To wear gloves during the procedure.
3. To clean the region with iodine and spirit.
4. Use of autoclaved procedure tray.
5. To discard cannula after 2 attempts.
6. If continuous fluids are being given, then to observe hourly.
7. To clean the needle hub using spirit swab before introducing drugs.
8. To flush the line with normal saline after injecting drugs.
9. To clean any surface with spirit (like IV bottles, rubber cap of vials etc.) before piercing with needle.
10. To change of IV tubing every day.

Second Phase

Five sessions of training which covered all nursing staff and residents was completed in two weeks. The case recruitment for second phase was completed from January 15, 2018 to April 15, 2018. Data collection was done as in first phase.

STATISTICAL ANALYSIS

SPSS 18 version was used. Mean values and standard deviations were calculated where indicated. Percentage was calculated for getting proportions. The p-value was calculated using student t-test. The p-value of <0.05 was considered significant.

RESULTS

Total of 190 babies with 300 IV lines and 120 babies with 373 IV lines were the subjects in first and second phase of study. Correlation of patient variables in phase one with mean duration of IV line stay is shown in [Table/Fig-1] which shows that the variable did not

significantly affect the duration of IV line stay. Effect of training on duration of stay of IV line, complications and indicated removal is showed in [Table/Fig-2].

Variables	Mean duration of IV line in situ	p-value
Patient age		
<7 days	2.18±3.0	0.9525
>7 days	2.2±2.8	
Sex		
Male	2.9±2.1	0.7002
Female	3.0±2.3	
Birth weight		
<2 kg	2.1±2.0	0.0900
>2 kg	2.6±2.8	
Gestational age		
<34 weeks	1.9±1.5	0.0730
>34 weeks	2.4±2.8	

[Table/Fig-1]: Patient variables and duration of IV line stay.

Heads	First Phase	Second phase	p-value
Total babies	120	190	
Total IV lines	300	373	
Number of IV line/baby	2.5	1.9	
Procedure done by Nurses.	213 (71%)	280 (75%)	0.2445
Procedure done by Residents	87 (29%)	93 (25%)	0.2445
Mean duration of IV line in situ (days)	2.5 (12 hours-6 days)	5 (26 hours-7 days)	<0.00001
Reason for IV line removal			
Complications	190 (63%)	125 (33.5%)	<0.0001
Indicated removal	98 (32.6%)	247 (66.4%)	<0.00001

[Table/Fig-2]: Comparison of two phases of study showing the effect of training.

The observations clearly show the effect of training on the duration of IV line stay and complications. Most cannula were inserted by nurses with NICU experience of at least for three years, still the training program improved the outcome. Experience and age of nurses is given in [Table/Fig-3]. All the nurses were staff nurses and residents were distributed among 3 years of residency equally.

Total no. and gender of nurses	Age (year)			Experience (year)		
	20-30	30-40	>40	1-5	6-10	>10
15 (13 female, 2 females)	2	10	3	3	9	3
Total no. and gender of residents	**Age (year)**			**Experience (month)**		
	20-30	>30		3-6	7-12	>12
24 (10 males,14 females)	21	3		08	09	07

[Table/Fig-3]: Showing age and experience of personnel.

Comparison of individual complications show that there was significant reduction in the most common complication, that is extravasations [Table/Fig-4].

Complications	First phase	Second phase	p-value
Extravasations (swelling pain)	90 (47%)	35 (28%)	0.00008
Blocked line	30 (16%)	30 (24%)	0.0781
Redness & pain	45 (23.6%)	40 (32%)	0.1007
Fluid leak	25 (13.15%)	20 (16%)	0.4801
Total	190 (63%)	125 (33.5%)	<0.00001

[Table/Fig-4]: Showing comparison of complications in two phases.

DISCUSSION

Complications due to cannula insertion in the present study were comparable with others [1-3]. Extravasation was more common as in other studies [1] that reduced significantly by training. Other complications also reduced though statistically not significant. Patient variables like weight, gestational age, day of life were not found to affect duration of stay of cannula. Though training of newly joined nurses is commonly done, in cases of experienced staff, it is not felt important. Due to high frequency of cannula insertion in NICU, staff becomes confident and approach becomes casual. This appears to be an important reason for high frequency of complications [1,2]. Training and continued periodic training appears to be very effective as per the index study and observed by other authors also [1,2,4,5].

LIMITATION

Whether there is need for repeated training and if yes how much should be the frequency per year needs to be studied.

CONCLUSION

To prevent the complications related to IV cannulation and increase the duration of stay of IV cannula, training of personnel working in NICU, irrespective of experience, is recommended.

REFERENCES

[1] Legemaat M, Carr PJ, van Rens RM, van Dijk M, Poslawsky IE, van den Hoogen A. Peripheral intravenous cannulation: Complication rates in the neonatal population: A multicenter observational study. J Vasc Access. 2016;17(4):360-65.
[2] Chin LY, Walsh TA, Van Haltren K, Hayden L, Davies-Tuck M, Malhotra A. Elective replacement of intravenous cannula in neonates- A randomized trial. Eur J Pediatr. 2018;177(11):1719-26. doi: 10.1007/s00431-018-3234-7.
[3] Faheim SS, Hassan HE. Peripheral intravenous complications of neonates: Effect of educational program for nurses on prevention and management. Saudi J Nurs Health Care. 2018;1(2):79-90.
[4] Gupta P, Rai R, Basu S, Faridi MM. Life span of peripheral intravenous cannula in a neonatal intensive care unit of a developing country. Indian J Pediatr Nurs. 2003;18:287-92.
[5] Ramasethu J. Complications of vascular catheters in the neonatal intensive care unit. Clin Perinatol. 2008;35(1):199-222.

PARTICULARS OF CONTRIBUTORS:
1. Professor, Department of Paediatrics, JNMC, Sawangi (Meghe), Wardha, Maharashtra, India.
2. Professor and Head, Department of Paediatrics, JNMC, Sawangi (Meghe), Wardha, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Bhavana Bhushan Lakhkar,
Department of Paediatrics, Sawangi (Meghe), Wardha-442004, Maharashtra, India.
E-mail: bhavanalakhkar53@gmail.com

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